

Alignment with Rotation Limited to 90° (10:30-12:00-1:30)

Take alignment readings in three positions with a total rotation of only 90°.

Can't go beyond 10:30? 0:00? 1:30?

From Optalign results at those 3 clock positions and further minor calculations, good alignment results can be obtained.










Moreover, Optalign's powerful MOVE function can be fully used.

This note allows you to obtain **final** alignment when obstructions limit rotation to 90°. (Do not confuse with the **rough** alignment procedure described in Tech Note 14).

Overview

Machine dimensions are entered in the Optalign as in a regular alignment. The alignment recording form can be used. Follow a normal alignment, except:

a) Zero the system at 12:00 o'clock, then enter the clock positions as:

Position	Keystrokes
12:00	 ,  , 
1:30	 ,  , 
10:30	 ,  , 

b) When entering the coupling function, use a coupling-center-to-prism distance of 0.1 inch.

c) Use a coupling diameter of 100.0 inch.

d) Record the coupling results: Vertical Offset, Horizontal Offset, Vertical Angularity, and Horizontal Angularity (VO, HO, VA, & HA).

Neither Optalign's foot corrections nor coupling results from the above method correspond to the actual corrections that should be made. Therefore, further calculations are necessary to obtain the correct results.

- e) $VAc = 0.0141 \times (\text{displayed VA value})$
- f) $HAc = 0.0341 \times (\text{displayed HA value})$

g) $VOc = VAc \times CP + 3.4 \times VO$

h) $HOc = HAc \times CP + 1.4 \times HO$

i) Shim =

$VAc \times (\text{prism-to-each foot}) - 3.4 \times VO$

j) Move =

$HAc \times (\text{prism-to-each foot}) - 1.4 \times HO$

These results will be very close to the results obtained from normal position readings. However, slight errors could be introduced due to:

- 1) Geometry of equipment.
- 2) Large angular misalignment (shaft angularity).
- 3) Optalign rounds off to the nearest 0.0005 inch (1/2 half thousandth).

Nonetheless, as angularity (angular misalignment) becomes small, the calculated results will approach the results obtainable from normal position readings.

Move

The move function can be utilized by taking null readings (3 measure readings without turning shaft) and then moving to the opposite sign from zero.

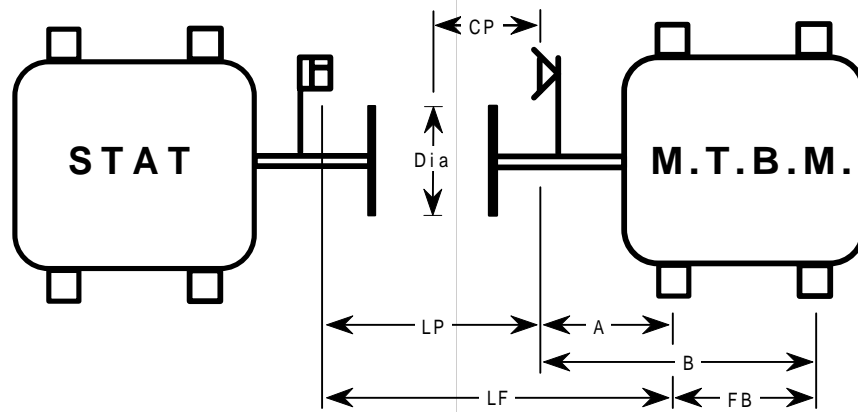
Dimensions are defined in the sketch for use in the calculations

LP=Laser-to-prism
 LF=Laser-to-front-foot
 FB=Front-to-back-foot
 CP=Coupling-center-to prism
 DIA=Coupling diameter
 $A = LF - LP$
 $B = A + FB$

VA = Vertical Angularity
 HA = Horizontal Angularity
 VO = Vertical Offset
 HO = Horizontal Offset

VAc=Vertical Angularity calculated.
 HAc=Horizontal Angularity calculated.
 VOc= Vertical Offset calculated (at CPLG center)
 HOc=Horizontal Offset calculated (at CPLG center)

Calculated coupling results should be used to compare against the allowable tolerances.



10:30 - 12:00 - 1:30 Alignment Procedure

- 1) **ON**, **/**, **ENT**.
- 2) Enter machine dimensions.
- 3) Zero system at 12:00 o'clock.
- 4) Take following 3 readings in any order:

Position	Keystrokes
12:00	M , 0 , ENT
1:30	M , 3 , ENT
10:30	M , 9 , ENT
- 5) **RUN** (ignore feet results).
- 6) **⇐**, replace displayed value with 0.1 inch. **1**, **/**, **ENT**.
- 7) Enter 100" DIA. **1**, **0**, **0**, **ENT**.
- 8) **RCL**, **RCL**, **RCL**.
- 9) Record Optalign coupling results (VO, HO, VA, & HA). Because readings were taken only 45° apart, results must be multiplied by correction factors to represent actual shaft position at the coupling. (Step 10)
- 10) Calculate actual coupling results, being careful to use proper mathematical signs.

$$VAc = 0.0141 \times VA \text{ (mils/inch)}$$

$$HAc = 0.0341 \times HA \text{ (mils/inch)}$$

$$VOc = VAc \times CP + (3.4 \times VO)$$

$$HOc = HAc \times CP + (1.4 \times HO)$$

11) Calculate foot corrections

$$\text{Front shim} = VAc \times A - (3.4 \times VO)$$

$$\text{Back shim} = VAc \times B - (3.4 \times VO)$$

$$\text{Front move} = HAc \times A - (1.4 \times HO)$$

$$\text{Back move} = HAc \times B - (1.4 \times HO)$$

Be careful to observe proper sign usage.

Example 1:

$$\begin{aligned} \text{LP} &= 4.1" & \text{LF} &= 4.6" \\ \text{FB} &= 7.0" & \text{CP} &= 2.8" \end{aligned}$$

Initial coupling values from Optalign:

$$\begin{aligned} \text{VO} &= 2.0, & \text{HO} &= 7.5 \text{ (mils)} \\ \text{VA} &= 270, & \text{HA} &= 220 \text{ (mils/100")} \end{aligned}$$

Calculating actual coupling results:

$$\begin{aligned} \text{VAc} &= 270 \times 0.0141 = 3.80 \text{ mils/inch} \\ \text{HAc} &= 220 \times 0.0341 = 7.50 \text{ mils/inch} \\ \text{VOc} &= 3.8 \times 2.8 + (3.4 \times 2.0) = 17.44 \text{ mils} \\ \text{HOc} &= 7.5 \times 2.8 + (1.4 \times 7.5) = 31.5 \text{ mils} \end{aligned}$$

Calculating foot corrections:

$$\begin{aligned} \text{A} &= 4.6 - 4.1 = 0.5" \\ \text{B} &= 0.5 + 7.0 = 7.5" \\ \text{Front shim} &= 3.8 \times 0.5 - (3.4 \times 2.0) \\ &= -4.9 \text{ mils (remove 5 mils)} \\ \text{Back shim} &= 3.8 \times 7.5 - (3.4 \times 2.0) \\ &= 21.7 \text{ mils (add 22.0 mils)} \\ \text{Front move} &= 7.5 \times 0.5 - (1.4 \times 7.5) \\ &= -6.75 \text{ mils (7 mils toward 9:00)} \\ \text{Back move} &= 7.5 \times 7.5 - (1.4 \times 7.5) \\ &= 45.75 \text{ mils (46 mils toward 3:00)} \end{aligned}$$

Be careful to observe proper sign usage.

Example 2:

$$\begin{aligned} \text{LP} &= 18.75", & \text{LF} &= 23.75" \\ \text{FB} &= 5.5", & \text{CP} &= 5.0" \end{aligned}$$

Initial coupling values from Optalign:

$$\begin{aligned} \text{VO} &= -8.0, & \text{HO} &= -2.5 \text{ mils} \\ \text{VA} &= -100.5, & \text{HA} &= -69.0 \text{ mils/100"} \end{aligned}$$

Calculating actual coupling results:

$$\begin{aligned} \text{VAc} &= 0.0141 \times (-100.5) \\ &= -1.42 \text{ mils/inch} \\ \text{HAc} &= 0.0341 \times (-69) \\ &= -2.35 \text{ mils/inch} \\ \text{VOc} &= (-1.42) \times 5.0 + (3.4 \times (-8.0)) \\ &= -7.1 + (-27.2) \\ &= -7.1 - 27.2 = -34.3 \text{ mils} \\ \text{HOc} &= (-2.35) \times 5.0 + (1.4 \times (-2.5)) \\ &= -11.75 + (-3.5) \\ &= -11.75 - 3.5 = -15.25 \text{ mils} \end{aligned}$$

Calculating foot corrections:

$$\begin{aligned} \text{A} &= 23.75 - 18.75 = 5.0" \\ \text{B} &= 5.0 + 5.5 = 10.5" \\ \text{Front shim} &= (-1.42) \times 5 - (3.4 \times (-8.0)) \\ &= -7.1 - (-27.2) \\ &= -7.1 + 27.2 \\ &= 20.1 \text{ mils (add 20 mils)} \\ \text{Back shim} &= (-1.42) \times 10.5 - (3.4 \times (-8.0)) \\ &= -14.9 - (-27.2) \\ &= -14.9 + 27.2 \\ &= 12.3 \text{ mils (add 12 mils)} \\ \text{Front move} &= (-2.35) \times 5 - (1.4 \times (-2.5)) \\ &= -11.75 - (-3.5) \\ &= -11.1 + 3.5 = -8.25 \text{ mils} \\ &= (\text{move 8 mils toward 9:00}) \\ \text{Back move} &= (-2.35) \times 10.5 - (1.4 \times (-2.5)) \\ &= -24.67 - (-3.5) \\ &= -24.67 + 3.5 = -21.17 \text{ mils} \\ &= (\text{move 21 mils toward 9:00}) \end{aligned}$$